DELAMAR SILVER MINE, PWS #3370024
SOURCE WATER ASSESSMENT FINAL REPORT

DATE: July 27, 2001

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment area, sensitivity factors associated with the wells, and aquifer characteristics.

This report, *Source Water Assessment for the Delamar Silver Mine, Owyhee County, Idaho*, describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The Delamar Silver Mine drinking water system consists of one well. The well has experienced an isolated incident in 1995 of microbial contamination, which may have been related to the distribution system and not the source, as no other detections of microbial contamination have occurred to date. The well has experienced a variety of inorganic chemical detections due to natural geochemical conditions of the aquifer. Detections above current drinking water maximum contaminant levels include arsenic and beryllium. Other inorganic chemical detections have been below the current drinking water maximum contaminant levels.

The Delamar Silver Mine facility is currently placed on a care and maintenance status as operations were suspended in December 1998. The drinking water well has also been classified as an unregulated system also in 1998; however, the DEQ Boise Regional Office has selected the system for Source Water Assessment.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

For the Delamar Silver Mine, source water protection activities should focus on environmental education with the recreational users, residents and with parties engaged in activities that may affect water quality within the vicinity. Best Management Practices aimed at reducing potential leaching of chemicals from industrial uses within the designated source water areas should be focused. Most of the designated areas are outside the direct jurisdiction of the Delamar Silver Mine. Partnerships with federal, state and local agencies and industry groups should be established and are critical to success. Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. Source water protection activities should be coordinated with the Bureau of Land Management, the Idaho Fish & Game Dept and other related agencies.

A community with a fully-developed source water protection program will incorporate many strategies. For assistance in developing protection strategies, please contact your regional Idaho Department of Environmental Quality office or the Idaho Rural Water Association.

The Idaho Department of Environmental Quality would like to thank Misters Brian J. Schrage, Ken Acree and Dave Couvelier of Kinross Delamar Mining Company for assistance in providing a well log for the drinking water well at Delamar Silver Mine, which was valuable in conducting the Source Water Assessment.

SOURCE WATER ASSESSMENT FOR THE DELAMAR SILVER MINE, IDAHO

Section 1. Introduction - Basis for Assessment

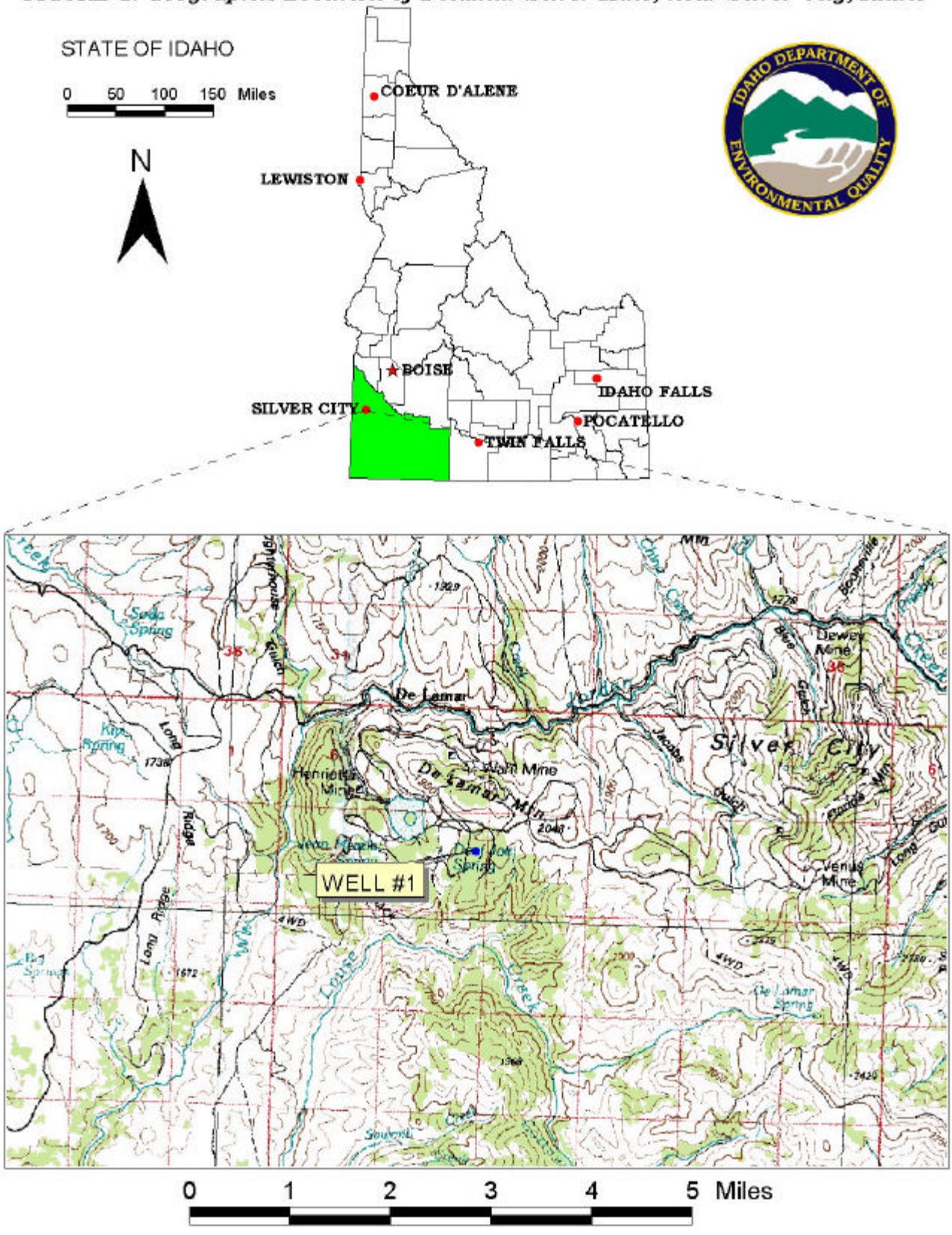
The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are attached. The list of significant potential contaminant source categories and their rankings, used to develop this assessment, is also attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess the over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The ultimate goal of this assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. The Idaho Department of Environmental Quality (DEQ) recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

FIGURE 1. Geographic Location of Delamar Silver Mine, near Silver City, Idaho



Section 2. Conducting the Assessment

General Description of the Source Water Quality

The Delamar Silver Mine in Owyhee County, Idaho serves a population of approximately 13 people. The mine is currently on care and maintenance schedule, and the source was placed on unregulated status in 1998. During mining operations the population served was approximately 125 people in 1994. The mine site is located approximately 5 miles southwest of Silver City, Idaho (Figure 1) in Owyhee County. The public drinking water system for the operation consists of one well.

The primary water quality issue currently facing the Delamar Silver Mine is that of inorganic chemical contamination, and the problems associated with managing the contamination. The water system has had detections of inorganic compounds (arsenic and beryllium) that have exceeded maximum contaminant levels. Other inorganic constituents have been detected below maximum contaminant levels. The inorganic constituents are naturally occurring and are related to the silicic volcanic aquifer material.

Defining the Zones of Contribution - Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time of travel zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. DEQ used a refined computer model approved by the EPA in determining the three-year (Zone 1B), six-year (Zone 2), and ten-year (Zone 3) time-of-travel (TOT) for ground water. The Delamar Silver Mine is within the Western Snake Plain aquifer system. The computer model used site-specific data, assimilated by DEQ from a variety of sources including the well log for the mine and other local well logs. The delineated source water assessment area for the Delamar Silver Mine can best be described as a southeasterly elongated fan encompassing roughly 143 acres (Figure 2). The actual data used by DEQ in determining the source water assessment delineation area is available upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act and has a sufficient likelihood of releasing such contaminants at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. The locations of potential sources of contamination within the delineation areas were obtained by field surveys conducted by DEQ and from available databases. The dominant land use outside the Delamar Silver Mine is predominantly recreation. Land use in the vicinity of the Delamar Silver Mine consists of mine related facilities.

It is important to understand that a release may never occur from a potential source of contamination provided best management practices are used at the facility. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or

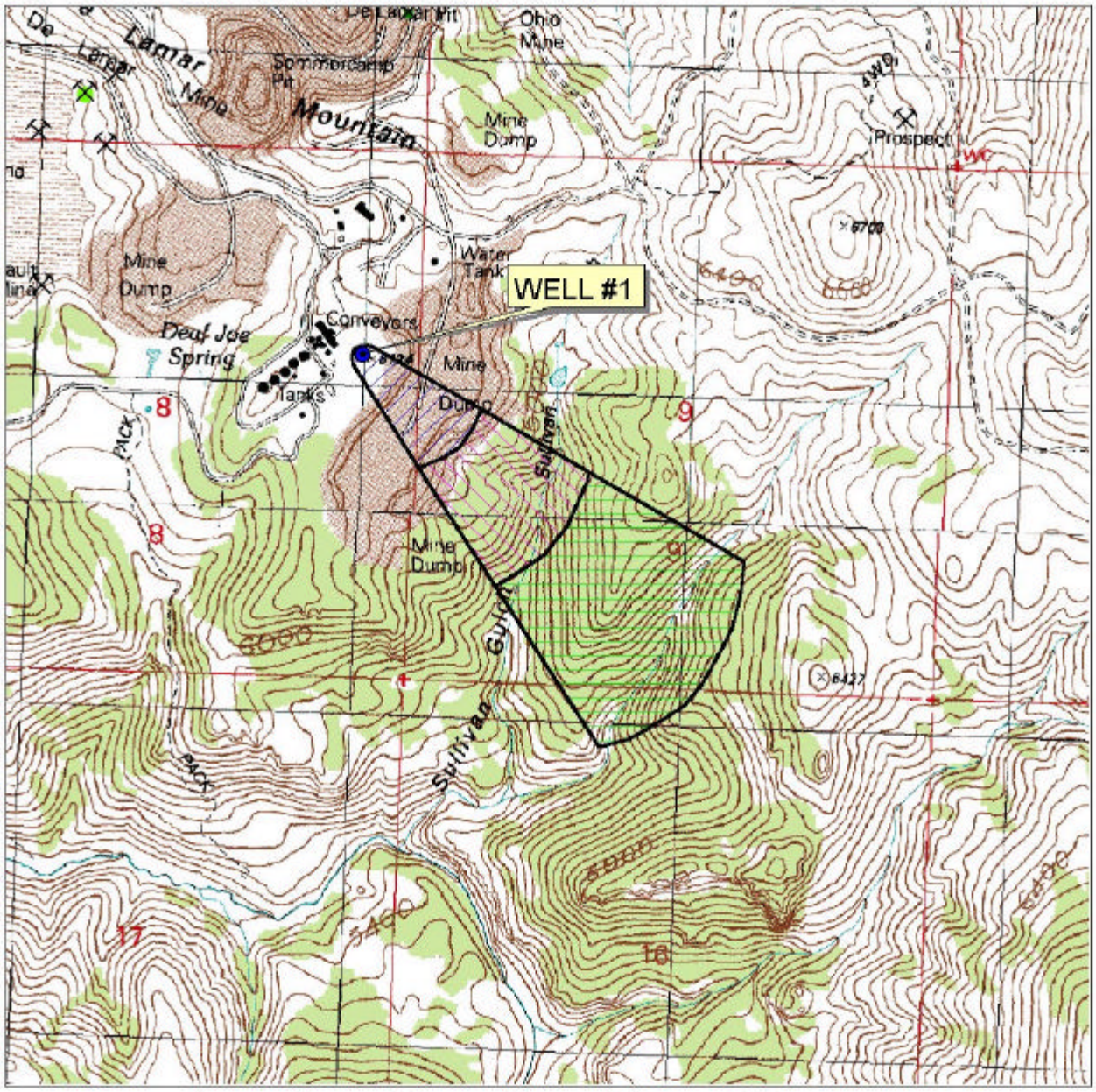
regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, such as educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A contaminant inventory of the study area was conducted during May of 2001. This involved identifying and documenting potential contaminant sources within the Delamar Silver Mine Source Water Assessment Area through the use of computer databases and Geographic Information System maps developed by DEQ.

No potential contaminant sources are located within the delineated source water area as determined by DEQ database; however, potential concern exists for volatile and synthetic organic chemical compounds associated with mine equipment.

Figure 2. Delamar Silver Mine Delineation Map and Potential Contaminant Source Locations



PWS# 3370024
WELL #1

Section 3. Susceptibility Analyses

The susceptibility of the source to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the well, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

Hydrologic sensitivity was moderate for the well (Table 2). This score is determined by soil drainage classification, vadose zone characteristics, depth to ground water and intervals of impermeable material. The well obtains water from a deep aquifer below intervals of rhyolite with clay lenses, rhyolitic breccia, ash, and tuff. The first water bearing zone occurs at a depth of 460 feet below land surface. There is an accumulative thickness of clay of 20 feet above the first water bearing zone. Clay gouge (indicative of a fault zone) was encountered at 1385 feet below land surface.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. Lower scores imply a system that can better protect the water. The Delamar Silver Mine drinking water system consists of one well that extracts ground water for domestic and industrial uses. The well system construction score is low.

The well for the Delamar Silver Mine system is completed to a depth of 2,000 feet below land surface. The well is cased to depth of 2,000 feet with screen placed beginning at a depth of 400 feet and continuing to the total depth of 2,000 feet. The surface seal extends to a depth of 50 feet.

The Idaho Department of Water Resources (IDWR) *Well Construction Standards Rules (1993)* require all public water systems (PWSs) to follow DEQ standards as well. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works (1997)* during construction. Various aspects of the standards can be assessed from well logs. The Delamar Silver Mine well is cased to a depth of 1,006 feet below land surface with 12 inch diameter casing having a thickness of 0.350 inches. The current standards call for 12-inch diameter casing to have a thickness of 0.375 inches. The Delamar Silver Mine well casing is reduced to 8 inch diameter casing with a thickness of 0.250 inches from a depth of 490 feet to 2,000 feet. The current standards require casing with an 8-inch diameter to have a minimum thickness of 0.322 inches.

Table 1. Selected Construction Characteristics of Delamar Silver Mine Well.

Well #	Total Depth (ft.)	Screened Interval (ft. below ground surface)	Screen Below Clay?	Gravel Pack Interval (ft.)
1	2,000	400-2,000	Yes*	No

*Cumulative thickness of 20 feet

Potential Contaminant Sources and Land Use

The well rated in the low category for inorganic, microbial, synthetic organic and volatile organic chemical classes. Land use is predominantly range/forest land with recreational activities. Potential concern exists for volatile and synthetic organic chemical compounds associated with mine equipment.

Final Susceptibility Ranking

In terms of the total susceptibility score, it can be seen from Table 2 that the well is high in susceptibility to microbial and inorganic chemicals due to recent detections above maximum contaminant levels. The well rated low in susceptibility to volatile and synthetic organic compounds and microbial contaminants. The well is obtaining water from water bearing zones beginning at 460 feet below land surface, offering protection from downward migration of contaminants from surface activities.

Table 2. Summary of Delamar Silver Mine Susceptibility Evaluation

Well #	**Susceptibility Scores[1]**									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	**Final Susceptibility Ranking**			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
1	M	L	L	L	L	L	H*	L	L	L*

[1]H = High Susceptibility, M = Moderate Susceptibility, Low Susceptibility
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
[2]H* - Indicates source automatically scored as high susceptibility due to presence of either a VOC, SOC, IOC or a microbial above the maximum contaminant level in the tested drinking water

Susceptibility Summary

The Delamar Silver Mine drinking water system is currently threatened by inorganic chemical contamination due to recent detections. The inorganic compounds of beryllium and arsenic have exceeded maximum contaminant levels. Other regulated inorganic compounds such as cyanide, fluoride, nitrate, and cadmium have been detected at concentrations below maximum contaminant levels. Inorganic compounds detected in the system are likely naturally occurring due to the high mineralization within silicic volcanic host rock. The EPA is currently reviewing consideration for lowering maximum contaminant levels for arsenic.

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

An effective source water protection program is tailored to the particular local source water protection area. A community with a fully developed source water protection program will incorporate many strategies. For the Delamar Silver Mine, source water protection activities should focus on environmental education with the recreational users, residents and with parties engaged in activities that may affect water quality within the vicinity. Even though the well is completed in the lower aquifer, protection within the vicinity will be of benefit to all users in the area. Most of the delineated areas are outside the direct jurisdiction of the Delamar Silver Mine. Partnerships with state and local agricultural agencies and industry groups should be established and are critical to success. Due to the time involved with the movement of ground water, wellhead protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. Source water protection activities can be coordinated with the the Idaho Department of Fish and Game, the U.S. Bureau of Land Management, and other federal, state and local agencies.

Assistance

Public water supplies and others may call the following IDEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments.

Boise Regional IDEQ Office (208) 373-0550

State IDEQ Office (208) 373-0502

Website: http://www2.state.id.us/deq

Water suppliers serving fewer than 10,000 persons may contact John Bokor, Idaho Rural Water Association, at 1-800-962-3257 for assistance with wellhead protection strategies.

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Attachment A
Delamar Silver Mine
Susceptibility Analysis Worksheet

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) 2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

> 13 High Susceptibility

Ground Water Susceptibility Report Public Water System Name : DELAMAR SILVER MINE Well# : WELL #1-PW-1

Public Water System Number 3370024 5/24/01 11:25:58 AM

1. System Construction		SCORE				
Drill Date		3/22/97				
Driller Log Available		YES				
Sanitary Survey (if yes, indicate date of last survey)		YES	1995			
Well meets IDWR construction standards		NO	1			
Wellhead and surface seal maintained		YES	0			
Casing and annular seal extend to low permeability unit		YES	0			
Highest production 100 feet below static water level		YES	0			
Well located outside the 100 year flood plain		YES	0			
	Total System Construction Score		1			
2. Hydrologic Sensitivity						
Soils are poorly to moderately drained		YES	0			
Vadose zone composed of gravel, fractured rock or unknown		YES	1			
Depth to first water > 300 feet		YES	0			
Aquitard present with > 50 feet cumulative thickness		NO	2			
	Total Hydrologic Score		3			
3. Potential Contaminant / Land Use - ZONE 1A			IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT		0	0	0	0
Farm chemical use high		NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A		YES	YES	NO	NO	NO
	Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0
Potential Contaminant / Land Use - ZONE 1B						
Contaminant sources present (Number of Sources)		NO	0	0	0	0
(Score = # Sources X 2) 8 Points Maximum			0	0	0	0
Sources of Class II or III leacheable contaminants or		NO	0	0	0	
4 Points Maximum			0	0	0	
Zone 1B contains or intercepts a Group 1 Area		NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land		0	0	0	0
	Total Potential Contaminant Source / Land Use Score - Zone 1B		0	0	0	0
Potential Contaminant / Land Use - ZONE II						
Contaminant Sources Present		NO	0	0	0	
Sources of Class II or III leacheable contaminants or		NO	0	0	0	
Land Use Zone II	Less than 25% Agricultural Land		0	0	0	
	Potential Contaminant Source / Land Use Score - Zone II		0	0	0	0
Potential Contaminant / Land Use - ZONE III						
Contaminant Source Present		NO	0	0	0	
Sources of Class II or III leacheable contaminants or		NO	0	0	0	
Is there irrigated agricultural lands that occupy > 50% of		NO	0	0	0	
	Total Potential Contaminant Source / Land Use Score - Zone III		0	0	0	0
Cumulative Potential Contaminant / Land Use Score			0	0	0	0
4. Final Susceptibility Source Score			4	4	4	4
5. Final Well Ranking			High	Low	Low	Low

POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (IDEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by IDEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory. Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water